

above scoring scheme above was also applied. Statistical analyses were performed using JMP software system. Significance was determined at the 0.05 level.

Results: Among the 26 patients, analysis were available in 25 (96%). There were 11 males and 15 females. The average age was 48 years. The average follow-up was 46 months. The average BMI was 32. The average graft size was 4.5 cm². The 4 scores for histological and electron microscopy evaluation were combined into 2 grades. When pre-operative WOMAC and KSS were compared, there was no statistical difference between the 2 groups. No significant difference in chondrocyte viability was noted on histological or electron microscopy between refrigerated and frozen allografts at the time of implantation. A trend towards greater improvement in WOMAC, KSS was noted in the frozen allograft group, although not statistically significant ($p=0.07$) An improvement in knee range of motion was noted in frozen allograft patients compared to those with a refrigerated allograft ($p=0.02$). There was no correlation between post-op x-ray score and outcome. 24% were considered failures and were analyzed separately. All failures were refrigerated allografts. No failures were noted if the histology score was Grade 2 or if the electron microscopy score was Grade 2. The likelihood ratio for a patient to do well if the initial histological score was 2 was 8.4 and if the electron microscopy score was 2 was 1.4.

Conclusions: Both refrigerated and frozen large osteochondral allografts appear to be function well clinically at 4 year follow-up. Long term follow-up is further needed.

Human Knee Cytokine Synovial Fluid Analysis Correlated with Grade of Knee Arthritis (SS-47). C. Thomas Vangness, Jr., MD, Steven Narvy, MD, Wendy Burke, MD, Alex Fedenko, MD, Robert MacPhee, MD

Introduction: Cytokines profoundly affect the balance between anabolic and catabolic processes in synovial joints. The purpose of this study was to evaluate the cytokine profile of human knee synovial fluid and correlate this with the degree of articular cartilage degradation, radiographic score, and synovial histology.

Methods: With IRB approval, synovial fluid was withdrawn before knee meniscetomy in 15 subjects with varying degrees of OA. Synovial fluid was analyzed for 22 different cytokines. Articular cartilage surfaces were scored via ICRS classification and radiographs graded by Kellgren-Lawrence classification. Synovial biopsies were taken for histological analysis.

Results: Synovial tissue histology did not correlate with grade of arthritis. Overall, there was an increase in

all cytokine levels with increasing grades of O.A. Correlation with ICRS grading showed consistent elevations of IL-1 and TNF with increasing ICRS scores (IV > III > II > I). The ICRS was much more accurate than Kellgren-Lawrence for correlating levels of cytokine activity.

Conclusions: This is the first study to extensively evaluate cytokine concentrations and correlate this with grade of human O.A. knee. Immunoassay profile proved to be sensitive and capable of yielding highly reproducible patterns of cytokine panels. This data demonstrated the molecular basis of disease progression and can assist in understanding the inflammatory response with OA progression. Cytokine biomarkers will help monitor disease progression and assist in future pharmacologic or surgical intervention.

Outcomes of Full-thickness Articular Cartilage Injuries of the Shoulder Treated with the Microfracture (SS-48). Benjamin H. Huffard, MD, Marilee P. Horan, BS, Peter J. Millett, MD, Richard J. Hawkins, MD

Introduction: Microfracture (Mcfx) has been an effective treatment for chondral lesions in the knee, but there is little evidence to support its use for chondral defects in the shoulder. The best treatment for articular cartilage defects in the shoulder remains unknown. The purpose of this study was to determine the pain and functional outcomes after microfracture in shoulder. The Mcfx procedure can improve function and pain in shoulders with symptomatic, full thickness chondral defects.

Methods: Mcfx was performed in shoulders with full thickness chondral lesions of the glenohumeral joint. Concomitant procedures for synovitis, loose bodies, partial cuff tear debridement, acromioplasty and instability were performed as indicated. Patients over 60 years of age and those with complete rotator cuff tears were excluded. Excluded from follow-up were 6 subjects that had subsequent surgery which were considered failures and 2 patients that died. Eighteen patients had two year subjective follow-up. Included were 16 men and 2 women with an average age of 45 years (range 24-59). Patient's pain and functional outcomes were measures using the American Shoulder and Elbow Surgeon Score (ASES) and patient satisfaction level (1 = unsatisfied, 10 = very satisfied). Data were analyzed using paired t-tests and regression analysis.

Results: Average follow-up was 40 months (range 25 – 67). Mean pain scores decreased from 3.6 preoperatively to 1.3 postoperatively (0 = no pain, 10 = worst pain). Patients' ability to work, ADL and sports activity had a significant improvement postoperatively ($p < 0.05$). Patient's painless use of their arm improved post-

operatively ($p < 0.05$). The average ASES score improved from 61 preoperatively to 82 postoperatively ($p < 0.05$). Average satisfaction with surgical outcome was 7.8 out of 10. There was an association with age at surgery and satisfaction with outcomes but not the ASES score. Patient's pain and function improved significantly postoperatively ($p < 0.05$). Half of the patients were involved in sports and report their ability to compete improved significantly postoperatively ($p < 0.05$).

Conclusions: The best treatment for articular cartilage defects in the shoulder remains unknown. Mcfx has been shown to be an effective treatment option for cartilage injuries in the knee. Outcomes after Mcfx in the shoulder have not been well studied. Our study shows that patients have less pain and improved shoulder function after surgical intervention, which included a Mcfx procedure. The Mcfx procedure can improve function and pain in shoulders with symptomatic, full thickness chondral defects.

Chondroprotective Effects of Hyaluronic Acid Following Oxidative Stress (SS-49). *Valentina Grishko, PhD, Albert W. Pearsall, MD, Glenn Wilson, MD*

Summary: The purpose of current study was to examine the mechanisms of chondroprotective effects of hyaluronic acid following reactive oxygen and nitrogen species -induced stress. We find that hyaluronic acid protects human chondrocyte mitochondria from oxidative stress by decrease of mitochondrial DNA damage and enhancing mitochondrial DNA repair. Hyaluronic acid pretreatment of human chondrocytes prevented mitochondrial transcription and ATP levels decrease following oxidative stress. Also hyaluronic acid prevented apoptosis induced in human chondrocytes following exposure to ROS and RNS by direct prevention of cytochrome c release and activation of caspase 9.

Purpose: The intra-articular injection of hyaluronic acid was originally used in the treatment of osteoarthritis to increase the viscosity of synovial liquid. However, recent findings suggest that the activity of HA cannot be solely explained by its biomechanical properties. Current study was performed to determine the mechanisms of chondroprotective action of hyaluronic acid on articular chondrocytes following reactive oxygen and nitrogen species generation as observed during osteoarthritis development. Chondrocyte mitochondrial function, apoptosis and viability following oxidative stress were main targets of present investigation.

Methods: All work was performed on primary articular chondrocyte cultures. Reactive oxygen species were generated by xanthine oxidase/hypoxanthine exposure,

reactive nitrogen species by peroxyxynitrite. DNA damage and repair were studied by quantitative Southern blot analysis; mitochondrial dysfunction was evaluated by Northern blot analysis of mitochondrial transcription and changes in ATP levels by bioluminescence assay. Apoptosis was evaluated by quantitation of apoptotic cells following DAPI staining, cytochrome c release, and caspases activation. Cell viability was evaluated by MTT assay.

Results: Hyaluronic acid protects human chondrocyte mitochondria by amelioration of mitochondrial DNA damage and enhancing mtDNA repair. Hyaluronic acid preserved mitochondrial transcription and ATP levels following oxidative stress. Also HA pretreatment led to increase of chondrocyte viability and decrease of apoptosis following xanthine oxidase/hypoxanthine and peroxyxynitrite treatment.

Conclusions: Mitochondria are important targets of hyaluronic acid chondroprotective action.

Physical Exam and Magnetic Resonance Imaging (MRI) in the Diagnosis of Superior Labrum Anterior-Posterior (SLAP) Lesions of the Shoulder (SS-50). *Nirav K. Pandya, MD, Anne Colton, MD, David Webner, MD, Brian Sennett MD, G. Russell Huffman, MD, MPH.*

Introduction: There is limited data comparing the sensitivity of physical examination and MR imaging in the diagnosis of arthroscopically confirmed glenoid labral lesions.

Methods: A review of 50 consecutive patients with arthroscopically confirmed superior labrum anterior-posterior (SLAP) lesions and no history of shoulder dislocation was performed. The study was prospectively designed with IRB approval. All patients underwent a standardized physical examination that was compared to the official radiologist's report of MR and/or MR arthrogram imaging. Sensitivity analysis was performed. To determine a difference in sensitivity of 8% between testing modalities, a pre-study power analysis determined that the minimal sample size was 25 patients (for a study with a power of 0.80 and an alpha of 0.05).

Results: The sensitivity of O'Brien's active compression test was 90%, whereas the Mayo (dynamic) shear was 80% and Jobe's relocation test was 76%. The sensitivity of a physical exam with any one of these three tests being positive was 100%; the sensitivity of requiring at least two positive tests ranged from 64% - 72%, and the sensitivity decreased to 58% if all three of these maneuvers was deemed necessary for the diagnosis. Neer (42%) and Hawkin's impingement tests (32%) each had low sensitivity for SLAP lesions. The sensitivity of MRI